
Concurrent Generation of Functional Smooth Muscle and Endothelial Cells via a Vascular Progenitor.

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Public Summary:

In this study, we derive smooth muscle cells for use in urinary incontinence.

Scientific Abstract:

Smooth muscle cells (SMCs) and endothelial cells (ECs) are typically derived separately, with low efficiencies, from human pluripotent stem cells (hPSCs). The concurrent generation of these cell types might lead to potential applications in regenerative medicine to model, elucidate, and eventually treat vascular diseases. Here we report a robust two-step protocol that can be used to simultaneously generate large numbers of functional SMCs and ECs from a common proliferative vascular progenitor population via a two-dimensional culture system. We show here that coculturing hPSCs with OP9 cells in media supplemented with vascular endothelial growth factor, basic fibroblast growth factor, and bone morphogenetic protein 4 yields a higher percentage of CD31⁺CD34⁺ cells on day 8 of differentiation. Upon exposure to endothelial differentiation media and SM differentiation media, these vascular progenitors were able to differentiate and mature into functional endothelial cells and smooth muscle cells, respectively. Furthermore, we were able to expand the intermediate population more than a billionfold to generate sufficient numbers of ECs and SMCs in parallel for potential therapeutic transplantations.

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